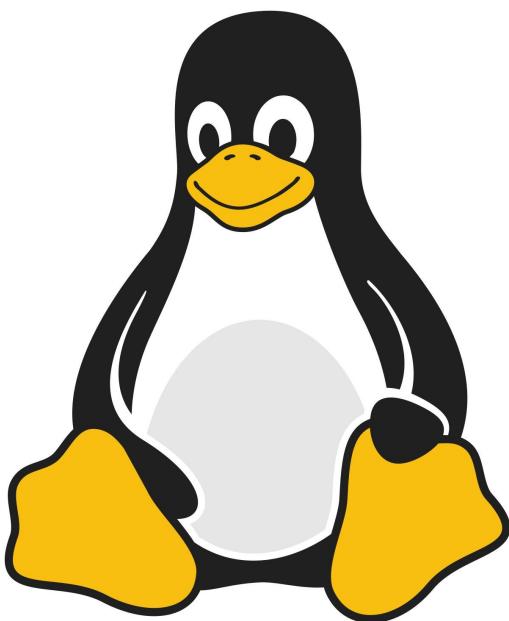


Lab 2

Intro to Linux



WHAT YOU WILL LEARN

How to navigate the Linux operating system and how to use the built in tools.

WHY IT'S IMPORTANT

Linux is the base operating system we will be using for the rest of the labs and is what will be installed on your Pi. Linux is also frequently used in the IT, cybersecurity, programming and networking fields and is growing increasingly popular with home users as well.

SKILLS GAINED

- Navigating the Linux operating system
 - Working with files in Linux
 - Other tips and tricks
-

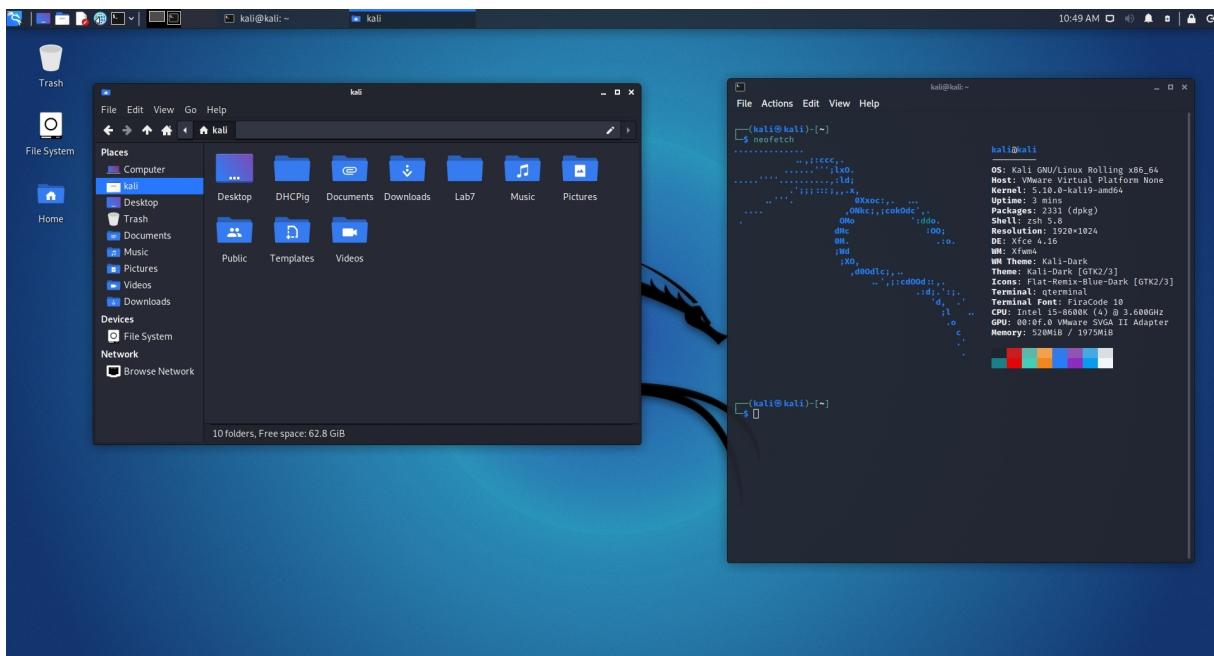
Estimated time to complete: 50 Min

REQUIRED HARDWARE

- Raspberry Pi
- Internet Connection

WHAT IS LINUX AND WHY USE IT?

Linux is an open source operating system that is frequently used in desktops, supercomputers, satellites, robotics, game consoles, smart devices, cars, and basically runs the entire internet. Linux is a powerful tool for programmers and system administrators because it is known for its customization, security, and large variety of tools available for any application. Linux is also absolutely free and open source, meaning that all the code that goes into the OS can be viewed and modified by the user, so you'll always know what's running on your computer. It is also known to be very stable, easy to maintain and able to run on any hardware, this is why it is so frequently used in infrastructure services, supercomputers, and IOT devices.

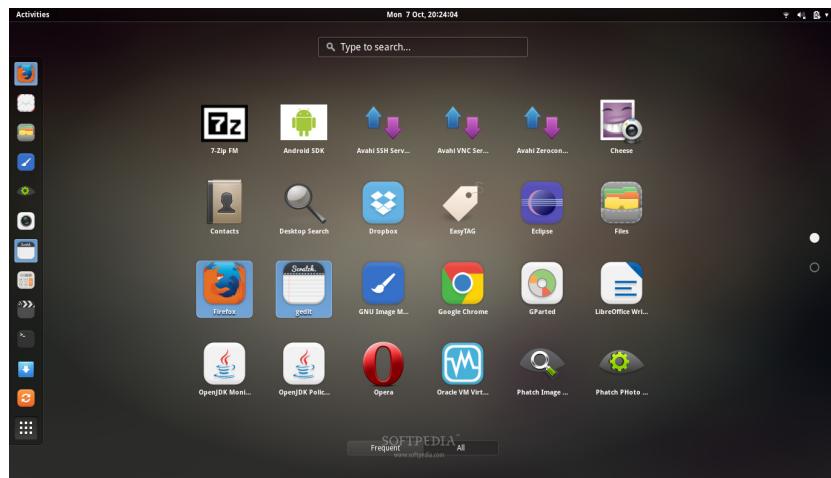


Kali Linux Desktop Environment

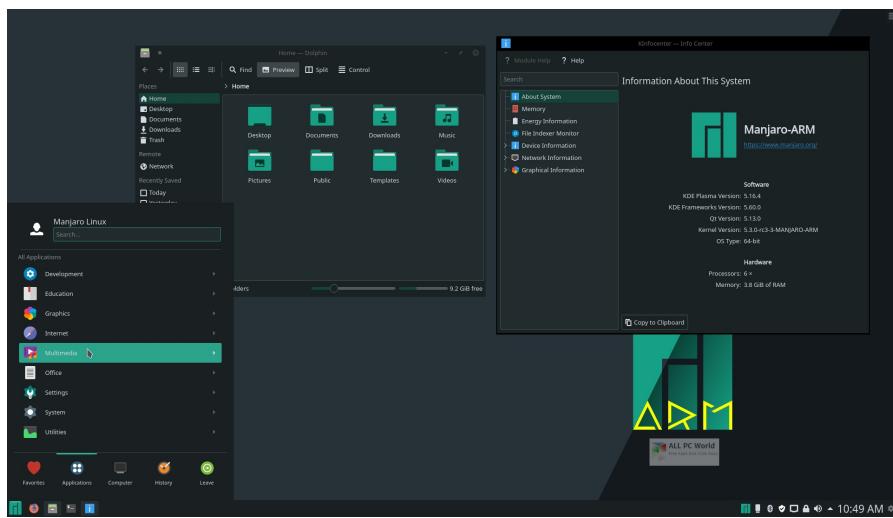
HOW IS IT DIFFERENT FROM WINDOWS?

While Linux has come a long way in terms of desktop usability, it's not quite like the Windows or Mac system you might be familiar with. There are two main desktop environments in Linux, GNOME and KDE. GNOME and KDE do basically the same thing, giving you a GUI desktop

environment and a way to interact with your hardware, they just look a bit different. GNOME is more closely related to the MacOS desktop while KDE looks more like the Windows desktop environment. These desktop environments give you a similar feel to other operating systems but you will most frequently be using the command line (terminal) to fulfill tasks on Linux.



GNOME

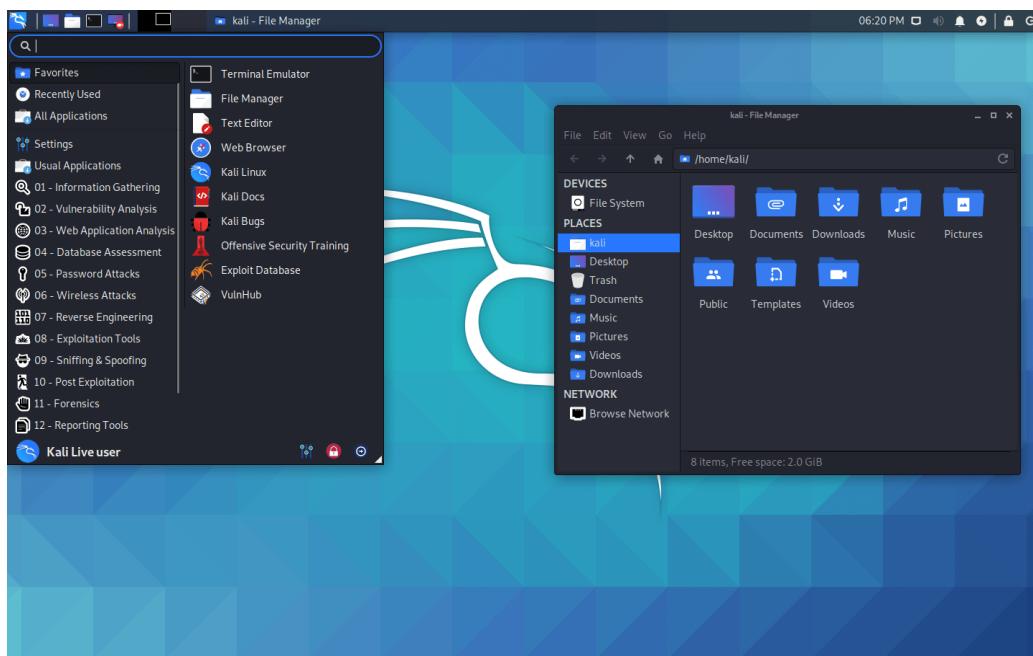


KDE

Installing applications is much easier on Linux as you can install, update, or uninstall any application with one command using a package manager like yum, apt, or dnf. Think of these software repositories like a built-in app store, containing all the applications you want without having to go to the internet to find what you need. Linux might seem intimidating at first but it really does the same things (and more!) as Windows or Mac, just in a slightly different way. If you get stuck with something or run into a bug, a quick Google search will bring you to many solutions already posted by the Linux community.

WHAT IS KALI?

Kali Linux is an open-source, Debian-based distribution of Linux that is designed for penetration testing, digital forensics, security auditing, and other information technology tasks. This distribution is maintained by Offensive Security and has over 600 different penetration testing programs and tools already available for you to use. We will be using this distribution throughout the labs.



WHY USE THE COMMAND LINE?

While being able to use a GUI may seem easier, learning how to use the command line will give you greater control over an application, is faster than a GUI, and is less resource-intensive. Learning the different commands is incredibly useful and becomes much quicker and more efficient as you familiarize yourself with what each command does.

WHAT IS DIRECTORY?

A directory in Linux simply means a location where files are stored. In other words, a directory is a file that contains other files, similar to a folder in Windows or Mac.

WHAT IS SUDO?

In Linux, sudo stands for super user do. Using the “sudo” command allows you to elevate your account to have root privileges temporarily, provided you have the root password. This lets you run programs or commands that a regular user would not be able to, think of this as running a command as an administrator.

HOW TO USE COMMANDS

Commands in Linux follow the structure: command [options] [arguments]. The argument is what the command is performing its action on. The options are there to modify the command and are generally preceded by a hyphen. Oftentimes multiple options can be strung together. If you are unsure of what options you can use with a command, typing “?” after the command will show you what options are available for the command.

Tip: In Linux, you can use the Tab key to finish typing out a command for you after you've typed in a few letters.

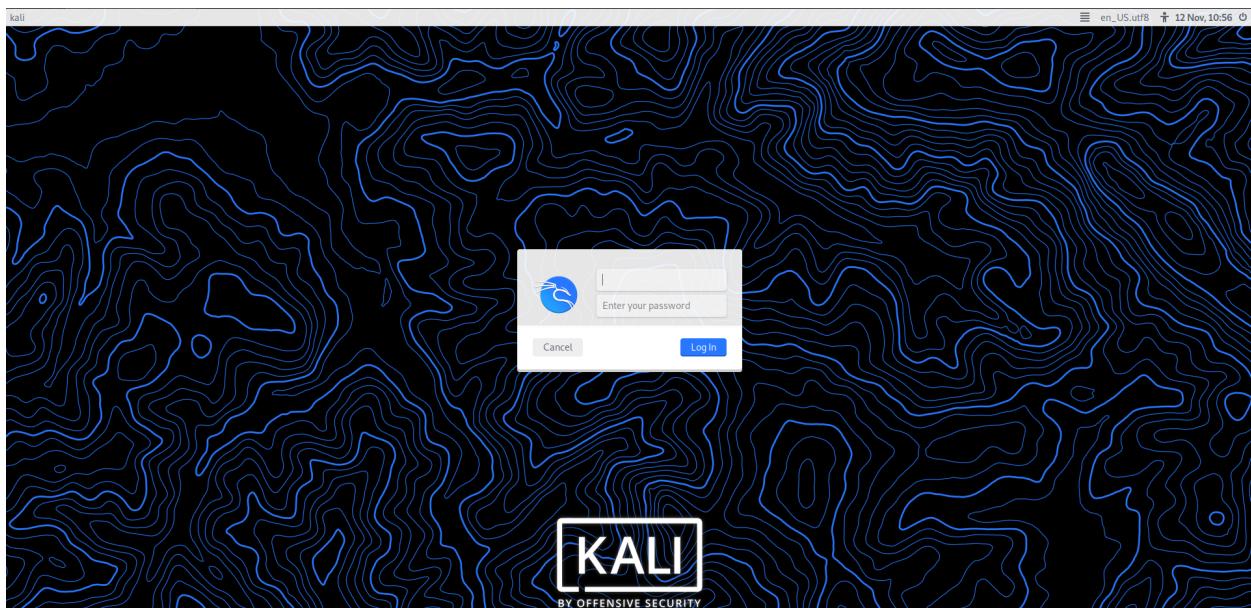
WHAT ARE SOME IMPORTANT COMMANDS?

- cd - Changes the working directory
 - cd ~ - home directory
 - cd .. - previous directory
- ls - Lists the contents of a directory
- grep - Searches for patterns in each file
- cat - Concatenate files and print on the standard output
- mkdir - Make directories
- touch - Change file timestamps or create empty file(s)
- rm - Remove files or directories
- mv - Move or rename files
- pwd - Print name of working directory
- locate - Finds files on the computer
- man - Shows description, options and information for any command
- wget - Download file from web link

GETTING STARTED WITH LINUX

STEP 1: LOG INTO KALI

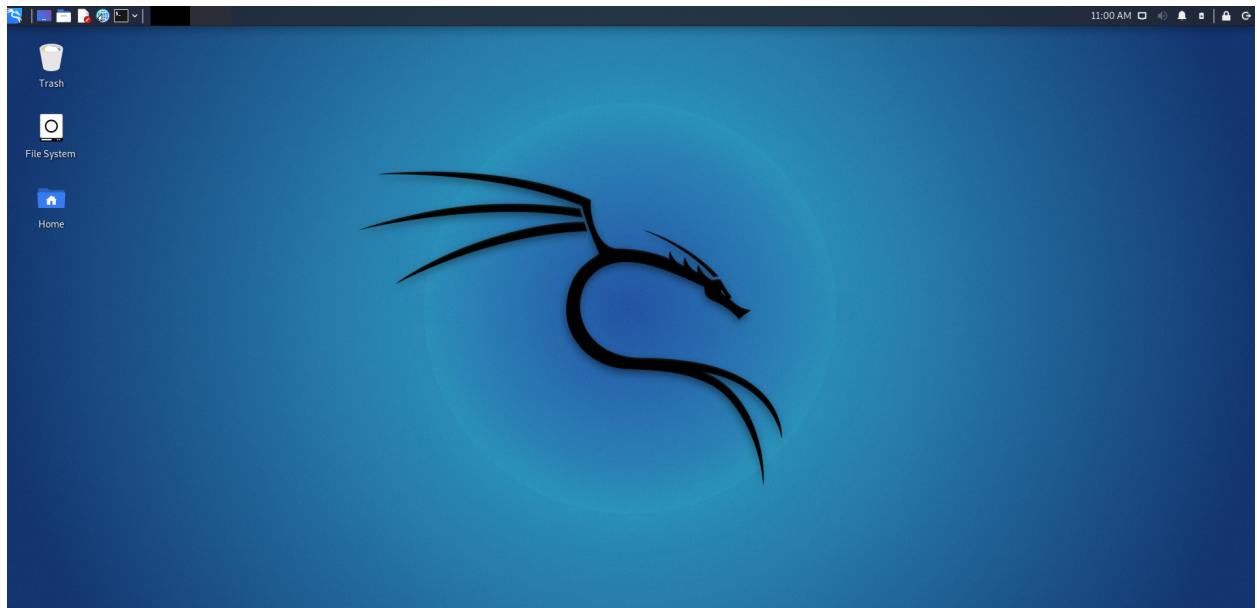
To begin our journey with Linux, we must first login to our device. In order to do this, plug in your Raspberry Pi and let it boot up until you are at the login screen seen below:



Use the default login info for your H.A.C.K Device which is:

Username: HACKUser

Password: Pentesstheworld1!



Once you have done this you should be greeted to the Kali Linux Desktop as seen below

STEP 2: CONNECTING TO THE INTERNET - DO ME PLEASE

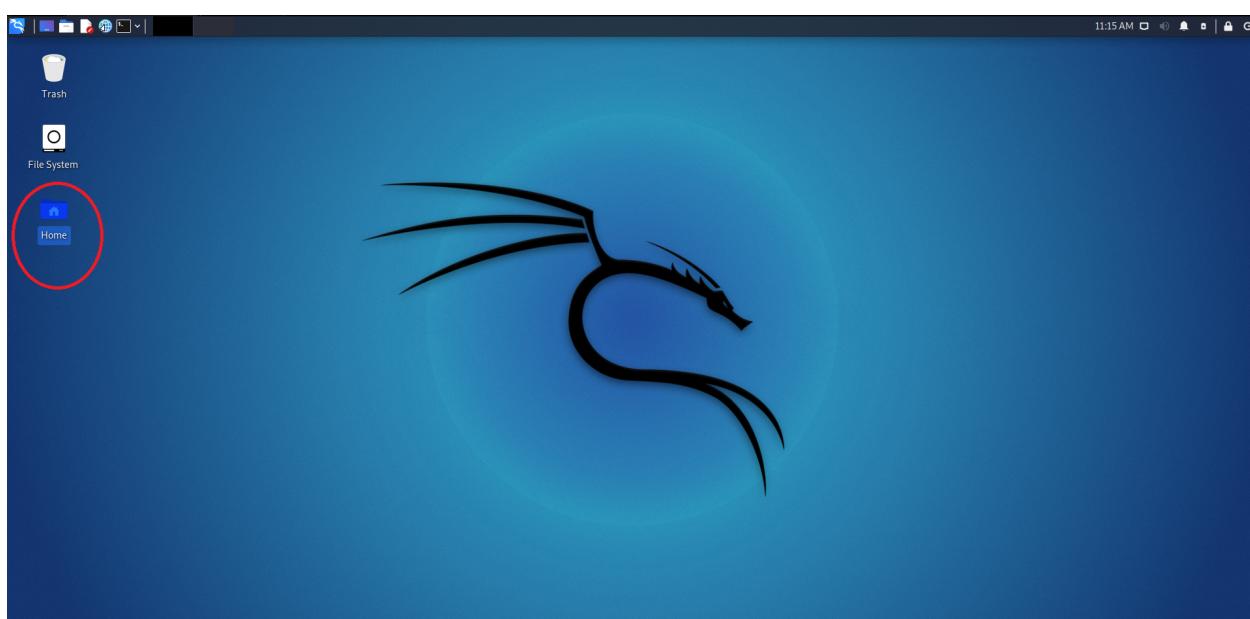
To begin, click on the network icon in the top toolbar, displayed as:



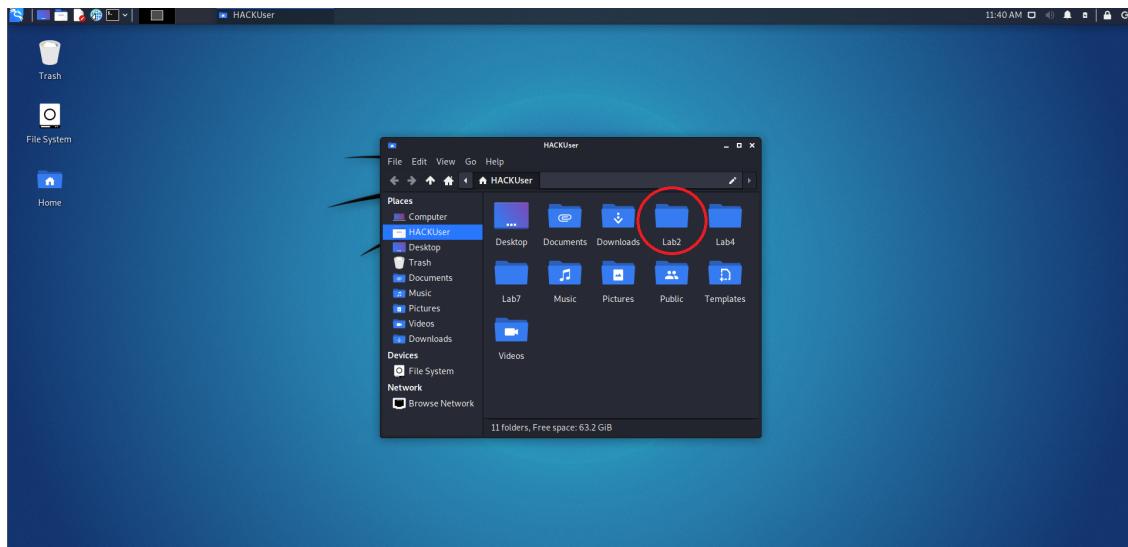
Right click on the icon and click Enable Wi-Fi, once enabled you can click on the network icon again to see all of the available networks, click the one you would like to connect to and enter the Wi-Fi password.

STEP 3: NAVIGATING FILES USING THE FILE BROWSER

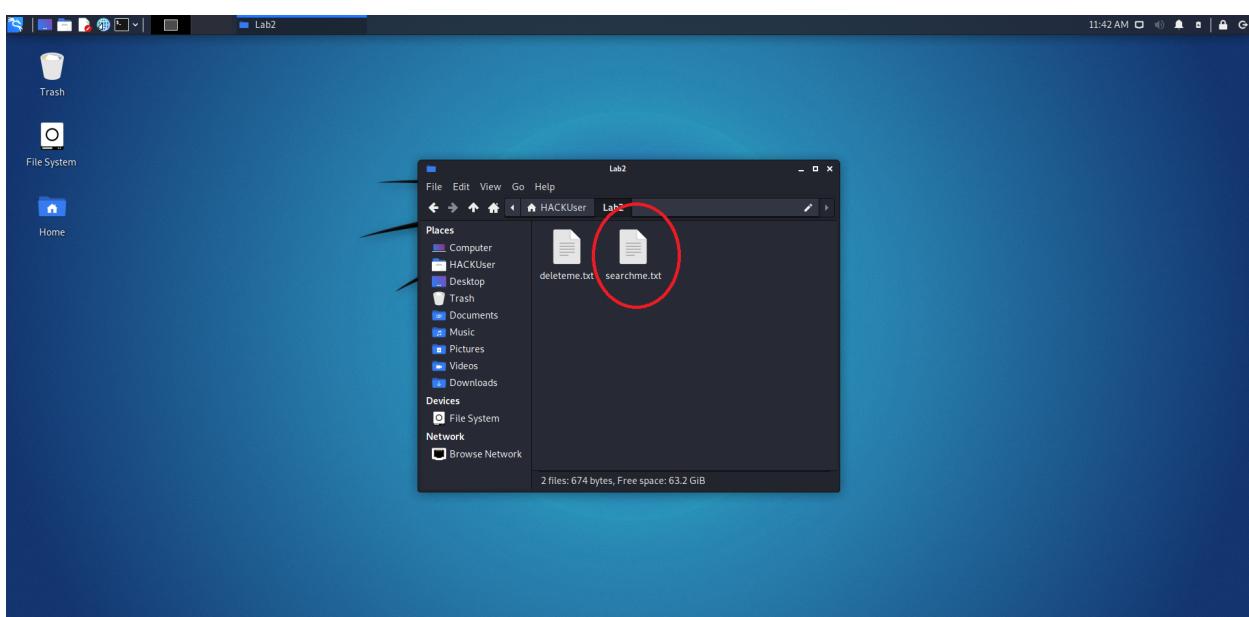
Once we are connected to the internet, we can start learning how to navigate Linux. First, click the “Home” Icon on the Desktop



From here we can see all the files in our home directory. The home directory is the directory you find yourself in when you first log in and contains the personal files for a particular user. We can click on the Lab 2 to see the files in the folder.



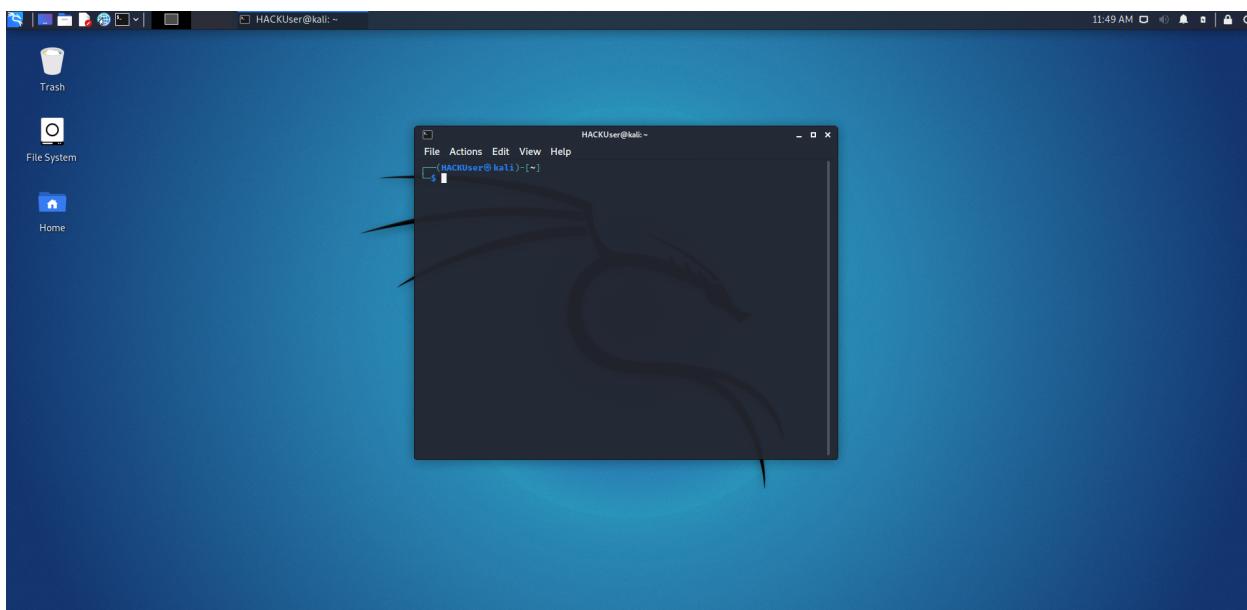
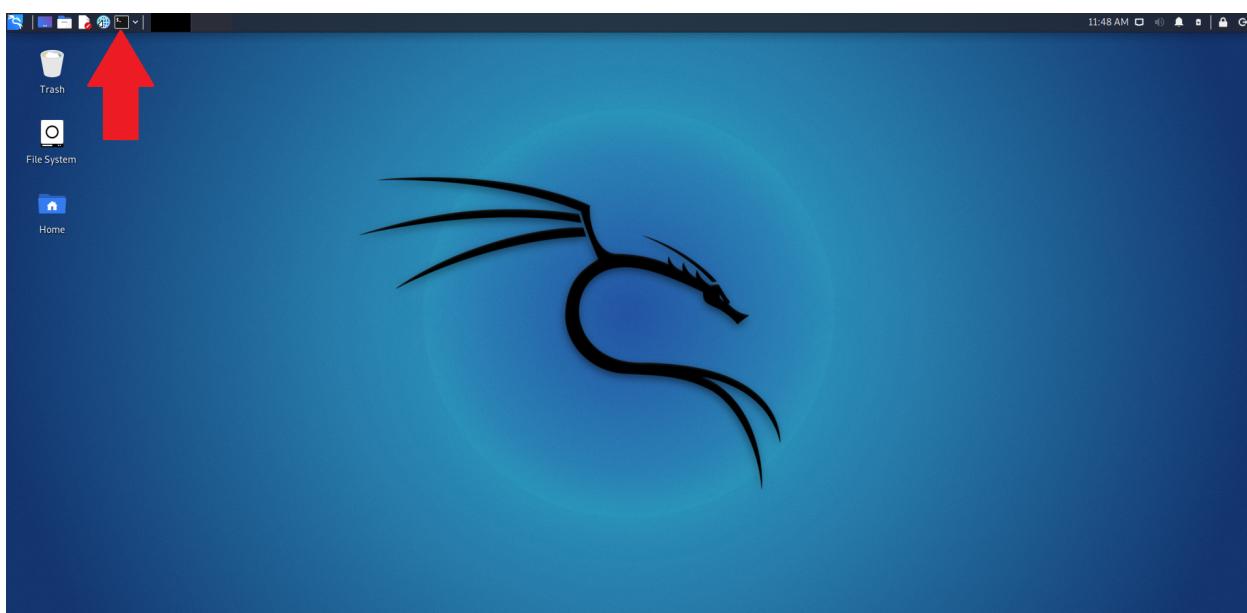
Here we should see 2 files named searchme.txt and deleteme.txt. Feel free to click on the files to see its contents



After you have inspected the contents of the file, you can begin searching around the computer using the sidebar until you feel comfortable. If you are lost and need to get back to your base home directory, you can always do `cd ~` in a terminal.

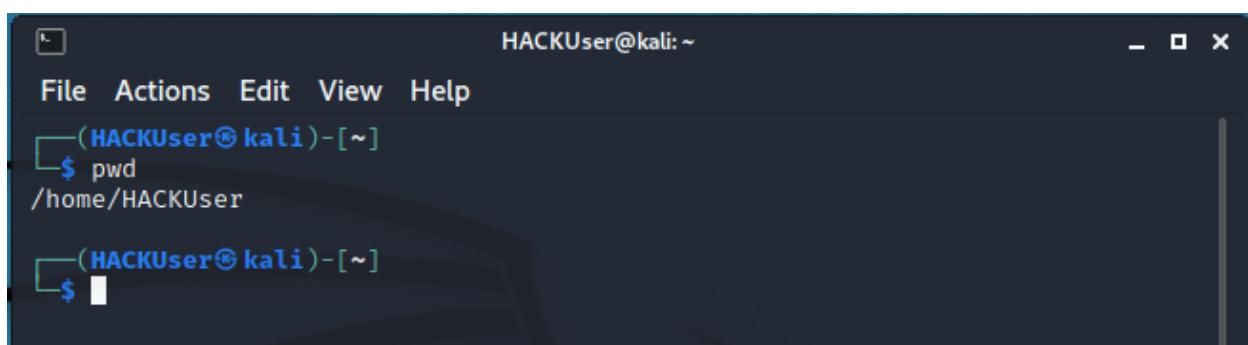
STEP 4: USING THE TERMINAL

Now that we understand what folders belong to our home directory, we can begin to learn how to use the terminal in Linux. Click the terminal icon on the top left corner in order to open a new terminal.



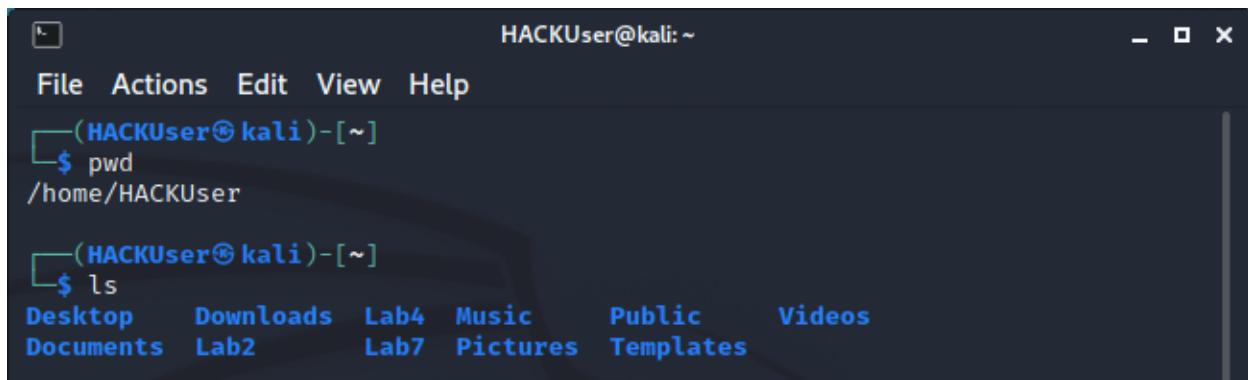
STEP 5: FINDING OUT WHERE YOU ARE - PWD AND LS

Having the terminal allows us to execute certain linux commands. However, before we begin creating items, we must find out where we are in the computer. In order to find out where we are we can type the command “pwd” and hit enter.



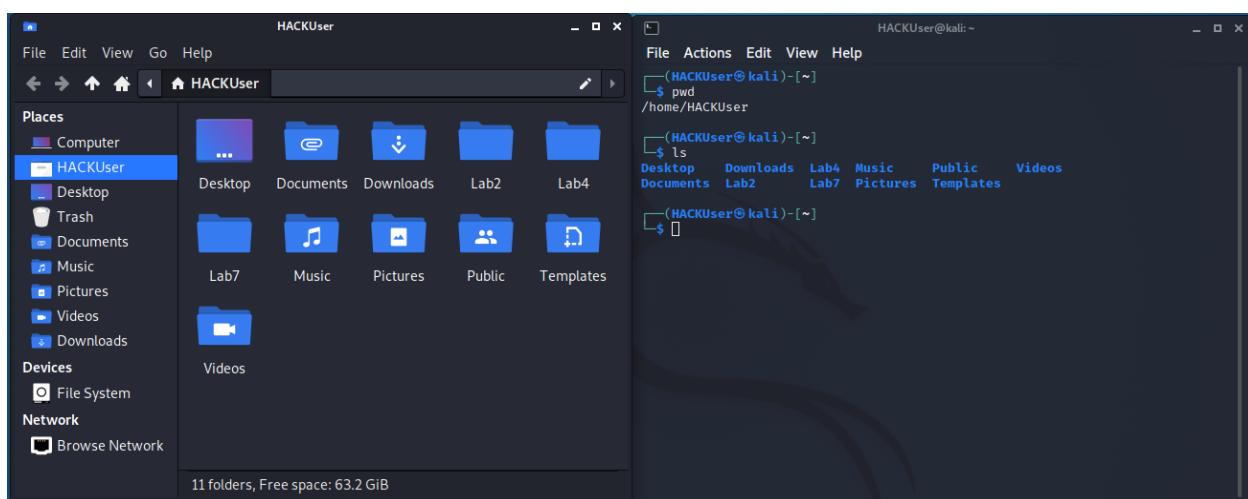
```
HACKUser@kali:~  
File Actions Edit View Help  
└─(HACKUser㉿kali)-[~]  
$ pwd  
/home/HACKUser  
└─(HACKUser㉿kali)-[~]  
$ █
```

Here we can see that when we are at the same location that we started at when we clicked the “Home” Icon on the desktop. This is our home directory. Now that we know where we are, we can begin to see what files are in our home directory. To do this, type in the command “ls” and hit enter.



```
HACKUser@kali:~  
File Actions Edit View Help  
└─(HACKUser㉿kali)-[~]  
$ pwd  
/home/HACKUser  
└─(HACKUser㉿kali)-[~]  
$ ls  
Desktop Downloads Lab4 Music Public Videos  
Documents Lab2 Lab7 Pictures Templates
```

Once again, we see all the files in our home directory, we can verify this by clicking the “Home” icon on the desktop again and see that all the files are the same.



STEP 6: CHANGING WHERE YOU ARE AT - CD

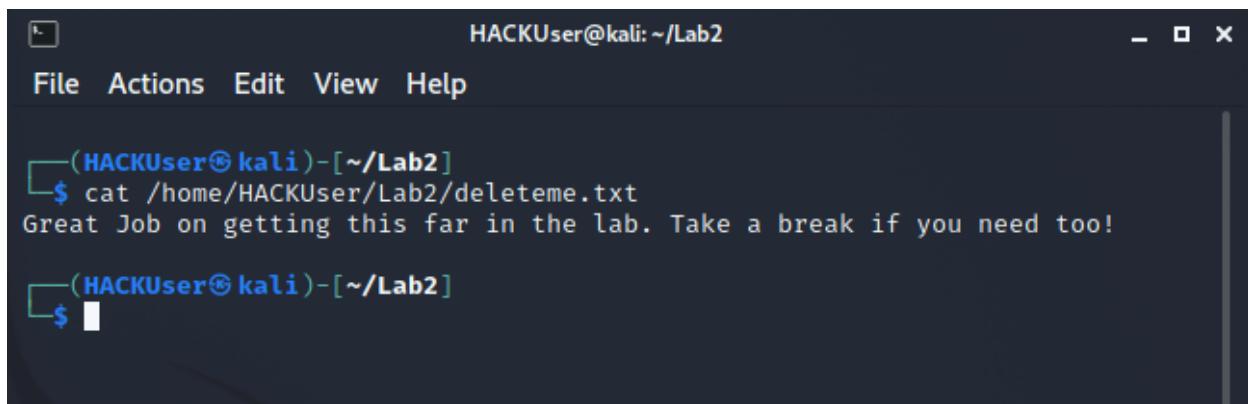
If we want to change where we are at in the terminal we can use the command “**cd**”. Type the command “**cd /home/HACKUser/Lab2/**” and hit enter to change into the Lab 2 folder in your home directory. Once you’ve done this, use the command “**ls**” again to verify that you see the two files “deleteme.txt” and “searchme.txt”

```
HACKUser@kali: ~/Lab2
File Actions Edit View Help
(HACKUser@kali)-[~/Lab2]
$ cd /home/HACKUser/Lab2/
(HACKUser@kali)-[~/Lab2]
$ ls
deleteme.txt  searchme.txt
```

STEP 7: READING A TEXT FILE - GREP AND CAT

While seeing the files in a directory is useful, sometimes we want to see the information stored within those files. In order to view **all** the information in a file we can use the command

“cat”. This will print out all the text to the command line. Try it out by using the command “**cat /home/HACKUser/Lab2/deleteme.txt**”



A screenshot of a terminal window titled "HACKUser@kali: ~/Lab2". The window has a standard Linux-style title bar with icons for minimize, maximize, and close. Below the title bar is a menu bar with "File", "Actions", "Edit", "View", and "Help". The main area of the terminal shows the command "cat /home/HACKUser/Lab2/deleteme.txt" being run, followed by its output: "Great Job on getting this far in the lab. Take a break if you need too!". The terminal prompt "\$" is visible at the bottom.

Here we can see that the file contained a short easy to read message. This is a perfect use for cat, because there isn't too much information. However, if we try to read the contents of a large file, the information can be too much for our terminal to read it all. Try to use the command “**cat /home/HACKUser/Lab2/searchme.txt**”.

A screenshot of a terminal window titled "HACKUser@kali: ~/Lab2". The window has a dark background and a light blue header bar at the top. The terminal menu bar includes "File", "Actions", "Edit", "View", and "Help". The main area of the terminal displays the following text:

```
to start thinking bee, my friend.  
- Thinking bee!  
- Me?  
  
Hold it. Let's just stop  
for a second. Hold it.  
  
I'm sorry. I'm sorry, everyone.  
Can we stop here?  
  
I'm not making a major life decision  
during a production number!  
  
All right. Take ten, everybody.  
Wrap it up, guys.  
  
I had virtually no rehearsal for that.
```

The prompt at the bottom left of the terminal window is "└─(HACKUser㉿kali)-[~/Lab2] \$".

Here we can see that the file is the entire script of the Bee Movie. Our terminal doesn't display all of the info on the file and we have to scroll up to try and read the file's contents. This is where the command "grep" comes in handy. We can use it to search the contents of a file to find a specific word. For example, if we wanted to see if John Travolta was mentioned in the file, we can use the command: `grep "John Travolta" /home/HACKUser/Lab2/searchme.txt`. Make sure to use quotations around the word "John Travolta"

```
(HACKUser㉿kali)-[~/Lab2]
$ grep "John Travolta" /home/HACKUser/Lab2/searchme.txt
- Why not? Isn't John Travolta a pilot?

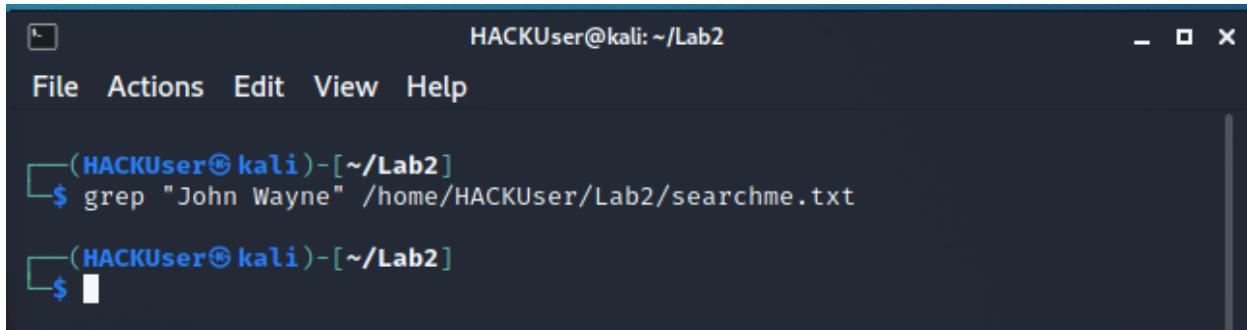
(HACKUser㉿kali)-[~/Lab2]
$
```

With our command we can see that John Travolta is actually mentioned in the file. We can also see how many times a certain word is in a file. Use the command **grep "bee"** */home/HACKUser/Lab2/searchme.txt* to see how many times the word bee is mentioned in the script.

```
(HACKUser㉿kali)-[~/Lab2]
File Actions Edit View Help
Technically, a bee
Making honey takes a lot of bees
That's why I want to get bees
That's the bee way!
Beep-beep! Beep-beep!
- That may have been helping me.
Oome on. You got to think bee, Barry.
- Thinking bee.
- Thinking bee.
Thinking bee!
Thinking bee! Thinking bee!
Thinking bee!
Thinking bee! Thinking bee!
Thinking bee!
Thinking bee! Thinking bee!
on bee power. Ready, boys?
made of millions of bees!
Are we going to be bees, or just
We're bees!
Mom! The bees are back!
It is bee-approved. Don't forget these.
That bee is living my life!
to start thinking bee, my friend.
- Thinking bee!

(HACKUser㉿kali)-[~/Lab2]
$
```

If a word is not contained within a file, grep will just return nothing. Use the command `grep "John Wayne" /home/HACKUser/Lab2/searchme.txt` to see if John Wayne is mentioned in the script.



A screenshot of a terminal window titled "HACKUser@kali: ~/Lab2". The window has a dark theme with white text. The menu bar includes "File", "Actions", "Edit", "View", and "Help". The terminal prompt is "(HACKUser㉿kali)-[~/Lab2]". The user has typed the command "\$ grep "John Wayne" /home/HACKUser/Lab2/searchme.txt" and pressed enter. The terminal shows the command and a blank line below it, indicating no results were found.

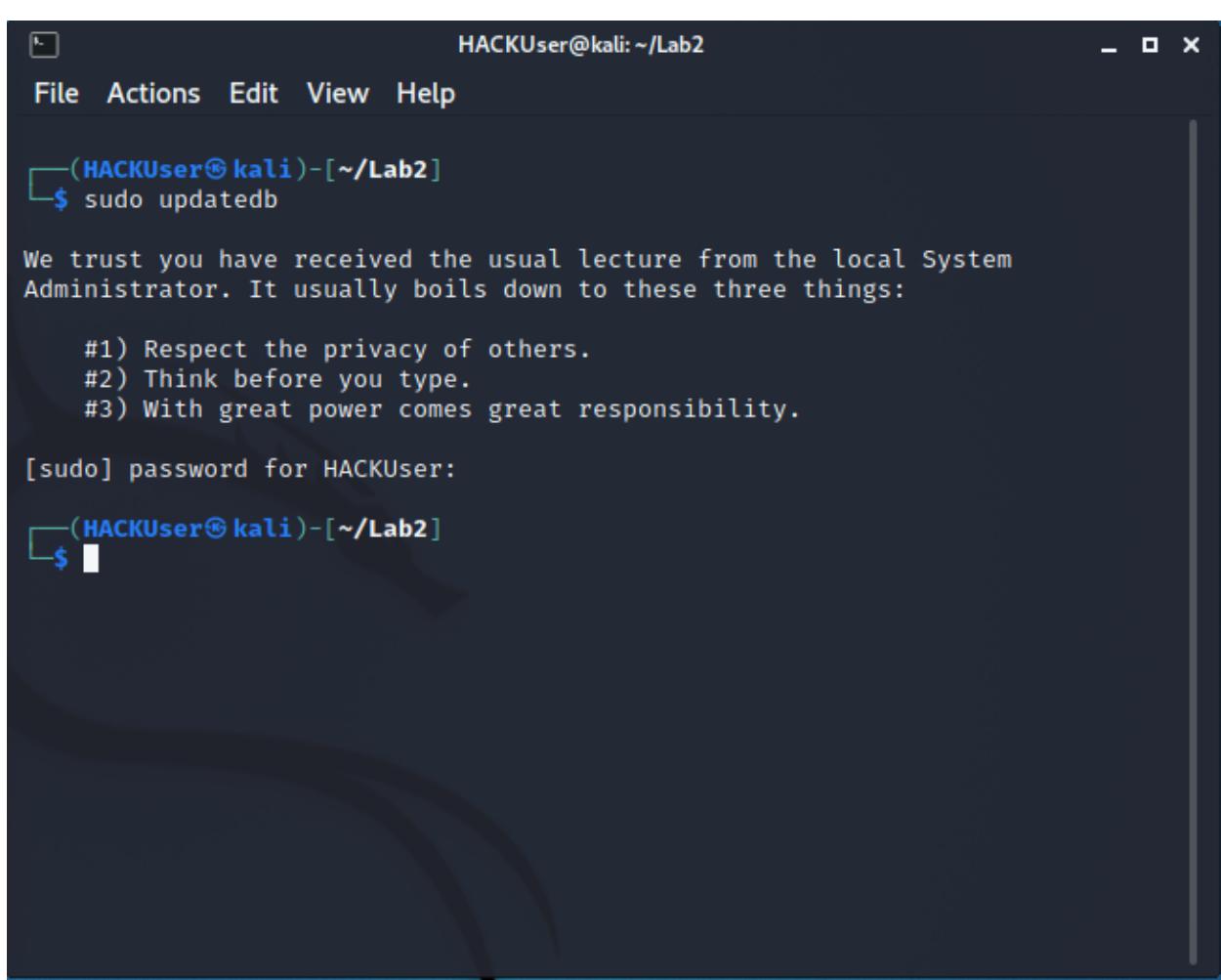
Here we can see that the words “John Wayne” are not in the file as grep returns nothing in response:

STOP: THIS IS A GOOD TIME TO TAKE A BREAK AND CONTINUE ANOTHER TIME IF NEEDED. CONSIDER THIS THE END OF PART 1 OF THE LAB.

MORE WITH LINUX

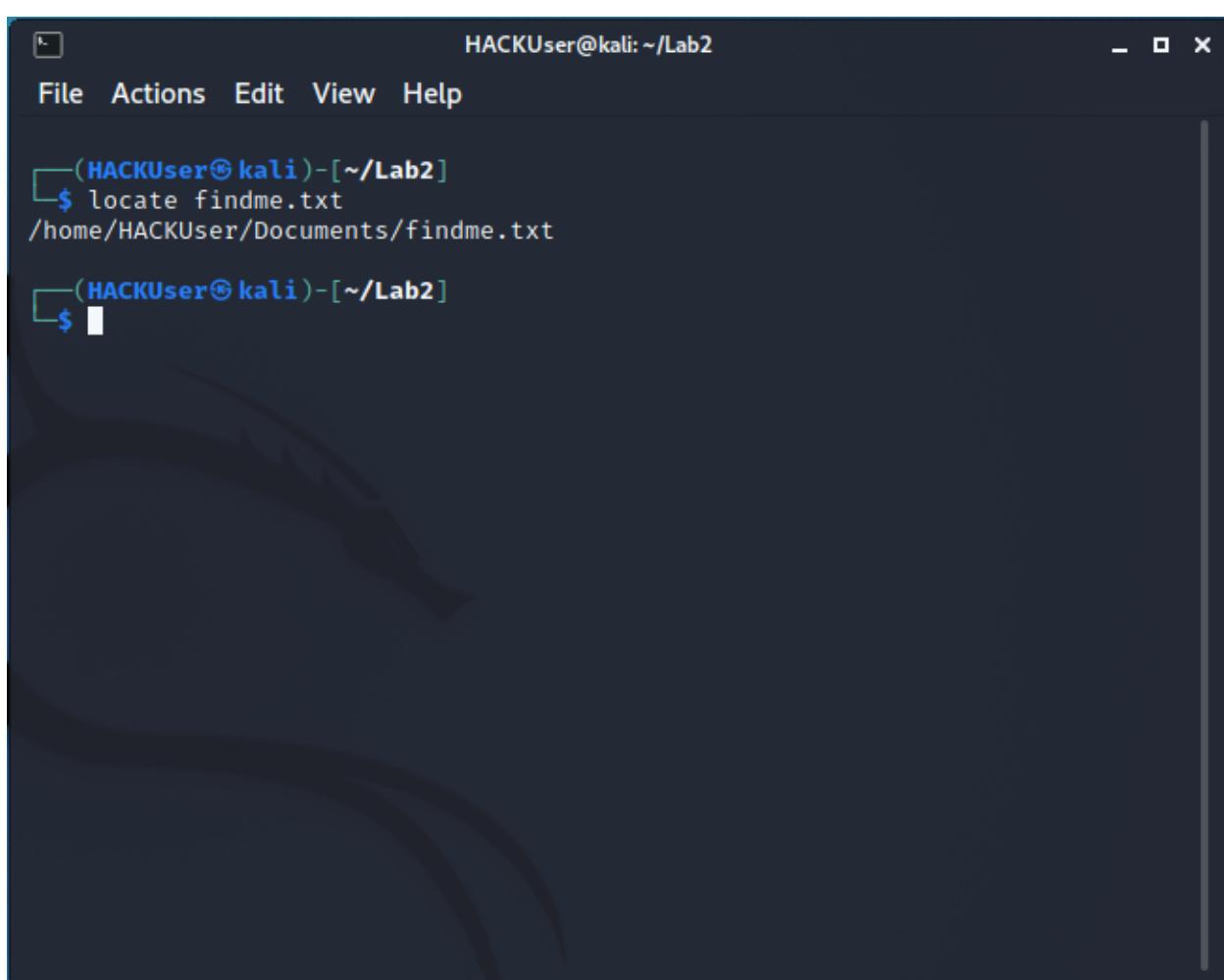
STEP 8: FINDING A FILE

Using files is great, but sometimes you just need to find a file. In Windows, you use the start button and search bar to find files. In Linux, you will use the command “locate”. We want to find the file named `findme.txt`. Before we start using the locate command, first type the command “`sudo updatedb`” in the command line. This command makes Linux search through all the files on the system to know where they are at. Type this command in the terminal and press enter. The terminal will ask for your password, input your password “`Pentesttheworld1!`” and hit enter.



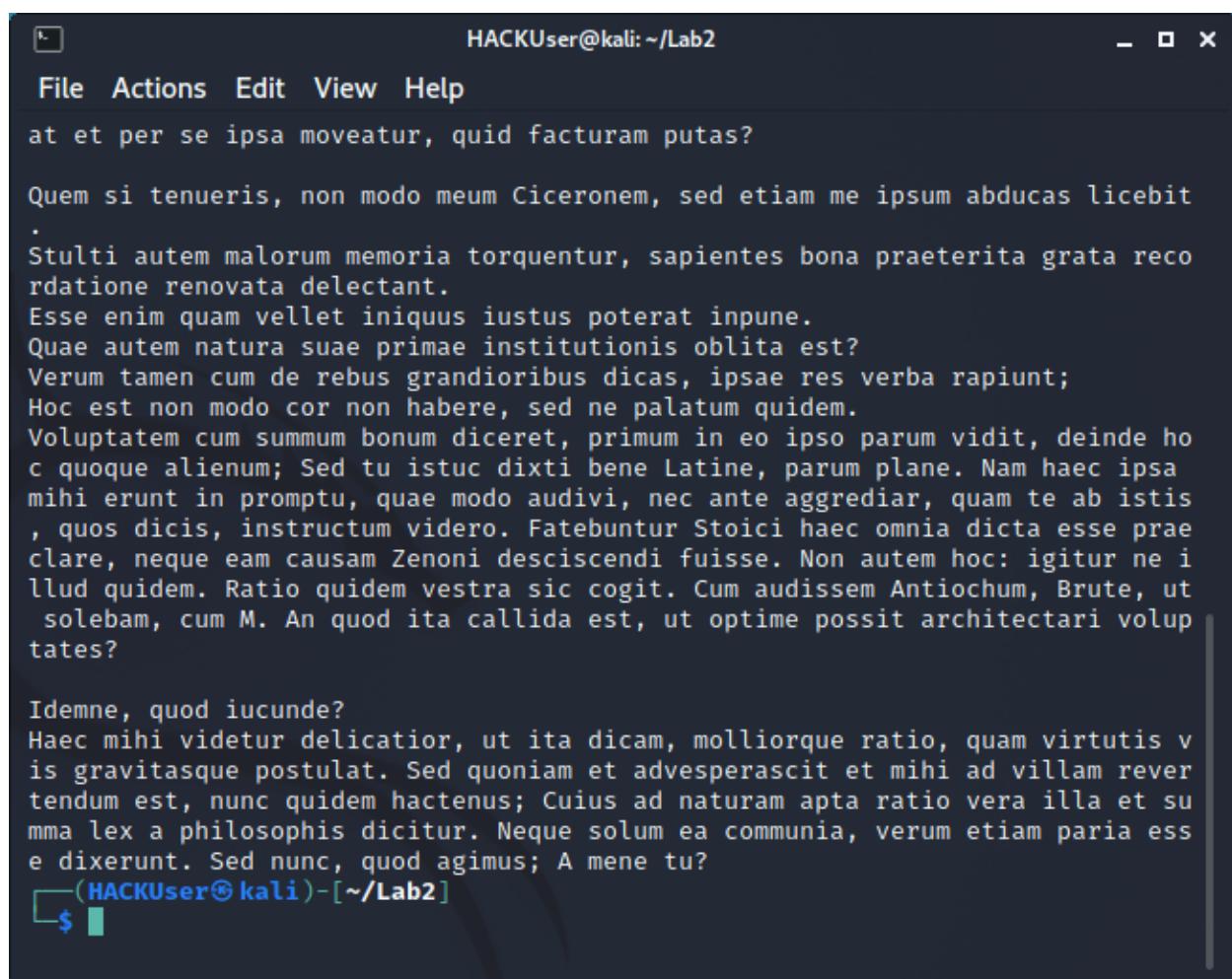
A screenshot of a terminal window titled "HACKUser@kali: ~/Lab2". The window has a dark background with light-colored text. At the top, there's a menu bar with "File", "Actions", "Edit", "View", and "Help". Below the menu, the terminal prompt shows the user is at "(HACKUser㉿kali)-[~/Lab2]". The user has run the command "\$ sudo updatedb". A message from the system follows, stating: "We trust you have received the usual lecture from the local System Administrator. It usually boils down to these three things:" followed by a list of three items: "#1) Respect the privacy of others.", "#2) Think before you type.", and "#3) With great power comes great responsibility.". Then, the user is prompted for a "[sudo] password for HACKUser:", indicated by a redacted password field.

Now that Linux knows where all the files are on the system, type the command “locate findme.txt



A screenshot of a terminal window titled "HACKUser@kali: ~/Lab2". The window has a dark background with light-colored text. At the top, there is a menu bar with "File", "Actions", "Edit", "View", and "Help". Below the menu, the terminal prompt shows "(HACKUser㉿kali)-[~/Lab2]". The user has run the command "locate findme.txt", which returns the path "/home/HACKUser/Documents/findme.txt". There is a vertical scroll bar on the right side of the terminal window.

Linux tells us that the file is at /home/HACKUser/Documents/findme.txt . We can confirm this and see the content of the files using the command “cat /home/HACKUser/Documents/findme.txt”



HACKUser@kali: ~/Lab2

File Actions Edit View Help

at et per se ipsa moveatur, quid facturam putas?

Quem si tenueris, non modo meum Ciceronem, sed etiam me ipsum abducas licebit.

Stulti autem malorum memoria torquentur, sapientes bona praeterita grata reconseruatione renovata delectant.

Esse enim quam vellet iniquus iustus poterat impune.

Quae autem natura suae primae institutionis oblita est?

Verum tamen cum de rebus grandioribus dicas, ipsae res verba rapiunt;

Hoc est non modo cor non habere, sed ne palatum quidem.

Voluptatem cum summum bonum diceret, primum in eo ipso parum vidit, deinde hoc quoque alienum; Sed tu istuc dixti bene Latine, parum plane. Nam haec ipsa mihi erunt in promptu, quae modo audivi, nec ante aggrediar, quam te ab istis, quos dicis, instructum video. Fatebuntur Stoici haec omnia dicta esse praeclare, neque eam causam Zenoni desciscendi fuisse. Non autem hoc: igitur ne illud quidem. Ratio quidem vestra sic cogit. Cum audisset Antiochum, Brute, ut solebam, cum M. An quod ita callida est, ut optime possit architectari voluptates?

Idemne, quod iucunde?

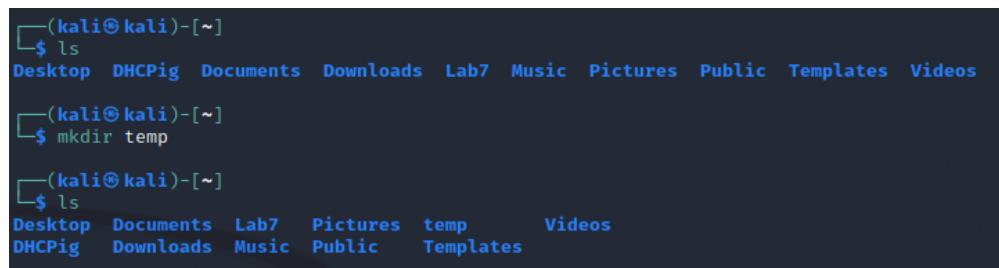
Haec mihi videtur delicatior, ut ita dicam, molliorque ratio, quam virtutis vis gravitasque postulat. Sed quoniam et advesperascit et mihi ad villam revertendum est, nunc quidem hactenus; Cuius ad naturam apta ratio vera illa et summa lex a philosophis dicitur. Neque solum ea communia, verum etiam paria esse dixerunt. Sed nunc, quod agimus; A mene tu?

└─(HACKUser㉿kali)-[~/Lab2]

\$

STEP 9: MAKING FILES AND DIRECTORIES - MKDIR AND TOUCH

Just like in other operating systems, the Linux file system is made up of files and folders. To create a file, use the **touch** command and to make a folder, use **mkdir**. Make a folder in your home directory by doing **mkdir temp**.



```
(kali㉿kali)-[~]
$ ls
Desktop  DHCPig  Documents  Downloads  Lab7  Music  Pictures  Public  Templates  Videos
(kali㉿kali)-[~]
$ mkdir temp

(kali㉿kali)-[~]
$ ls
Desktop  Documents  Lab7  Pictures  temp      Videos
DHCPig  Downloads  Music  Public    Templates
```

Cd into the temp folder you just created and do **touch temp.txt**, you can then do **ls** to ensure the file was created correctly.

```
(kali㉿kali)-[~]
└─$ cd temp

(kali㉿kali)-[~/temp]
└─$ touch temp.txt

(kali㉿kali)-[~/temp]
└─$ ls
temp.txt
```

STEP 10: MOVING AND REMOVING FILES - RM AND MV

We can also rename, move and delete files with the command line as well. To rename a file, do **mv filename newname**. Try to change the name of your temp file to temp2.txt by doing **mv temp.txt temp2.txt**.

```
(kali㉿kali)-[~/temp]
└─$ ls
temp.txt

(kali㉿kali)-[~/temp]
└─$ mv temp.txt temp2.txt

(kali㉿kali)-[~/temp]
└─$ ls
temp2.txt
```

We use the **mv** command to move files as well, just do **mv filename /home/newlocation**. Try to move the temp2.txt file to your desktop by doing **mv temp2.txt /home/kali/Desktop**, the file should appear on your desktop.

```
(kali㉿kali)-[~/temp]
└─$ ls
temp2.txt

(kali㉿kali)-[~/temp]
└─$ mv temp2.txt /home/kali/Desktop

(kali㉿kali)-[~/temp]
└─$ cd /home/kali/Desktop

(kali㉿kali)-[~/Desktop]
└─$ ls
temp2.txt
```

To delete a file, just use the rm command. Delete the temp2.txt file by doing **rm temp2.txt**.

STEP 11: GETTING HELP WITH COMMANDS

To find information about or options for our command we can look at the manual page by doing **man x**. Let's do this with the ls command to start. Running **man ls** in the terminal will send you to this page:

```
LS(1)                               User Commands                               LS(1)

NAME
    ls - list directory contents

SYNOPSIS
    ls [OPTION] ... [FILE] ...

DESCRIPTION
    List information about the FILEs (the current directory by default). Sort entries alphabetically if none
    of -cftuvSUX nor --sort is specified.

    Mandatory arguments to long options are mandatory for short options too.

    -a, --all
        do not ignore entries starting with .

    -A, --almost-all
        do not list implied . and ..

    --author
        with -l, print the author of each file

    -b, --escape
        print C-style escapes for nongraphic characters

    --block-size=SIZE
        with -l, scale sizes by SIZE when printing them; e.g., '--block-size=M'; see SIZE format below

    -B, --ignore-backups
        do not list implied entries ending with ~

    -c      with -lt: sort by, and show, ctime (time of last modification of file status information); with
           -l: show ctime and sort by name; otherwise: sort by ctime, newest first

    -C      list entries by columns

    --color[=WHEN]
        colorize the output; WHEN can be 'always' (default if omitted), 'auto', or 'never'; more info be-
        low

    -d, --directory
        list directories themselves, not their contents

    -D, --dirend
        generate output designed for Emacs' dirend mode

    -f      do not sort, enable -au, disable -ls --color

    -F, --classify
        append indicator (one of */=>@|) to entries

    --file-type
        likewise, except do not append '*'

    --format=WORD
        across -x, commas -m, horizontal -x, long -l, single-column -1, verbose -v, vertical -C
```

Here you can see how to use the command under synopsis, a description of what the command does and the options you can use with the command. You can also see author and version info and where to send bug reports for the utility. Below you can see the difference of using **ls** and using **ls** with the **-all** option on the home directory.

```
(kali㉿kali)-[~]
└─$ ls
Desktop  DHCPig  Documents  Downloads  Lab7  Music  Pictures
(kali㉿kali)-[~]
└─$ ls -a
.          .bashrc.original  DHCPig      .face.icon
..         .BurpSuite        .dmrc       .gnupg
.bash_history .cache        Documents   .ICEauthorit
.bash_logout  .config       Downloads  .java
.bashrc      Desktop        .face       Lab7
```

HOW TO USE TEXT EDITORS

There are many options to edit text files in Linux, some come pre installed but you can get more beginner friendly options with apt-get. Let's start by creating a text file on our Desktop. Enter the command **cd /home/kali/Desktop** to move to the Desktop, then do **touch test.txt** to make an empty text file, it should appear on your desktop.

Now let's install some text editors so you can see which one you like. You can download notepadqq or leafpad with the command **sudo apt-get install leafpad** or **sudo apt-get install notepadqq**, these are generally easier to use than the pre-installed utilities.

```
(kali㉿kali)-[~]
└─$ sudo apt-get install leafpad
[sudo] password for kali:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Suggested packages:
  evince-gtk
The following NEW packages will be installed:
  leafpad
0 upgraded, 1 newly installed, 0 to remove and 537 not upgraded.
Need to get 90.9 kB of archives.
After this operation, 465 kB of additional disk space will be used.
Get:1 http://kali.download/kali kali-rolling/main amd64 leafpad amd64 0.8.18.1-5 [90.9 kB]
Fetched 90.9 kB in 1s (81.9 kB/s)
Selecting previously unselected package leafpad.
(Reading database ... 277766 files and directories currently installed.)
Preparing to unpack .../leafpad_0.8.18.1-5_amd64.deb ...
Unpacking leafpad (0.8.18.1-5) ...
Setting up leafpad (0.8.18.1-5) ...
Processing triggers for kali-menu (2021.3.3) ...
Processing triggers for desktop-file-utils (0.26-1) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for man-db (2.9.4-2) ...
Processing triggers for mailcap (3.70) ...
```

Now you can open the text file by using the name of the text editor then the file name, such as **leafpad text.txt**. This will open the file and allow you to edit it. Other utilities preinstalled to do this are **vi**, **vim**, **gedit**, and **nano**. Which one you use is personal preference.

Try using a few of these utilities and see which one you like best.

REVIEW

1: What are common uses of Linux?

- A) Supercomputers
- B) Smart devices
- C) Desktops
- D) All of the above

2: The mkfile command is used to create a new empty file (True/False)

3: Which cd command will take you to your home directory?

- A) cd ~
- B) cd .
- C) cd -
- D) cd home

4: What Linux command is used to find information about another command?

- A) help
- B) man
- C) info
- D) guide

5: The most common way to install a software or tool on Linux is using a package manager (True/False)

6: Which statement about Linux is **NOT** true?

- A) Linux is open source
- B) There are many different versions of Linux
- C) Linux command line is barely used
- D) Linux can run on almost any hardware

Answers: 1:D 2:False 3:A 4:B 5:True 6:C

